CLAIMS

1. Tuneable laser apparatus comprising a tuneable laser, a thermal sensor and a controller, characterised in that said controller controls at least one or a combination of the following variables: the currents, the voltages, a tuning section and a phase section; and incorporates means which adjust any appropriate one or combination of said variables taking into account the laser's output wavelength dependency on temperature and section currents/voltage, whereby the output wavelength may be kept at the desired operating value without any significant mode jump whatever the temperature of operation within the laser's operative range.

2. Apparatus according to claim 1, comprising no closed loop laser temperature control means.

3. Apparatus according to any preceding claim, further comprising a low pass filter for removing rapidly changing signals in the control currents or voltages.

4. Apparatus according to any preceding claim, wherein the laser is a Distributed Bragg Reflector (DBR) tuneable laser diode.

5. Apparatus according to any one of claims 1 to 3, wherein the laser is a Distributed Feed Back (DFB) tuneable laser diode.

6. Apparatus according to any one of claims 1 to 3, wherein the laser is a Sampled Grating Distributed Bragg Reflector (SG-DBR) tuneable laser diode and the controller includes a processor programmed to follow the tuneability mapping of the two or more tuning section and/or phase section currents or voltages, and feeds control signals to those sections suitable to give the required wavelength.

7. Apparatus according to any one of claims 1 to 3, wherein the laser is a Super Structure Grating Distributed Bragg Reflector (SSG-DBR), tuneable laser diode and the controller includes a processor programmed to follow the tuneability mapping of the two or more

tuning section and/or phase section currents or voltages, and feeds control signals to those sections suitable to give the required wavelength.

8. Apparatus according to any one of claims 1 to 3, wherein the laser is a vertical cavity filter laser and the controller includes a processor programmed to follow the tuneability mapping of the two or more tuning section and/or phase sections currents or voltages, and feeds control signals to those sections suitable to give the required wavelength.

9. Apparatus according to any preceding claim, wherein the apparatus incorporates a coolerless system associated with an optical phase lock loop (OPLL) to provide a frequency referenced coolerless laser diode.

10. Apparatus according to any preceding claim, wherein the apparatus incorporates a coolerless system associated with an optical injection phase lock loop system (OIPLL) to provide a frequency referenced coolerless laser diode.

AMENDED CLAIMS

[received by the International Bureau on 10 September 2004 (10.09.04); original claims 1-10 replaced by amended claims 1-17 (3 pages)]

1. A wavelength stabilisation system for a tuneable laser comprising:

i) A tuneable semiconductor laser;

ii) A thermal sensor to sense the laser temperature;

iii) A controller that utilises the previously determined relationship between laser output wavelength, the laser temperature and the bias applied to those parts of the laser responsible for its tuning characteristics;

wherein the controller determines values for the bias to be applied to one or more of those parts of the laser responsible for its tuning characteristics in such a manner as to generate an optical signal of highly stable wavelength in the presence of variations in ambient temperature, such controller not requiring the use of any synchronous modulation or detection technique.

2. A wavelength stabilisation system as in claim 1, in which the controller determines the value(s) of one or more current sources which are applied to one or more of those parts of a laser that control the laser output wavelength by carrier injection.

3. A wavelength stabilisation system as in claim 1, where the controller determines the value(s) of one or more voltage sources which are applied to one or more of those parts of a laser that control the output wavelength of the laser by applied electric field.

4. A wavelength stabilisation system as in claim 1, where the output wavelength is maintained independent of laser temperature and without mode jump through control of bias applied to a laser phase adjustment section based upon prior knowledge of the dependence of side mode suppression ratio on laser temperature and phase adjustment section bias.

5. A wavelength stabilisation system as in claim 1, where the laser is a Distributed Bragg Reflector (DBR) tuneable laser diode comprising three sections one for the laser gain, one for the laser phase and one for the grating (laser tuning section) with a typical operating temperature range of 0 to 70°C and a typical tuneability range of 8nm.

6. A wavelength stabilisation system as in claim 5, where the DBR laser has a long phase adjustment section typically in excess of 0.5mm to allow control of the phase over the full operating range of temperature.

7. A wavelength stabilisation system as in claim 1, where the laser is a Distributed Feed Back (DFB) tuneable laser diode comprising two or more sections with a typical operating temperature range of 0 to 70°C and a typical tuneability range of 8nm.

8. A wavelength stabilisation system as in claim 1, where the laser is a Sampled Grating Distributed Bragg Reflector (SG-DBR) tuneable laser diode with a typical operating temperature range of 0 to 70°C and a typical tuneability range of 40 nm.

9. A wavelength stabilisation system as in claim 8, where the SG-DBR laser has a long phase adjustment section typically in excess of 0.5 mm to allow control of the phase over the operating range of temperature.

10. A wavelength stabilisation system as in claim 1, where the laser is a Super Structure Grating Distributed Bragg Reflector (SSG-DBR), tuneable laser diode with a typical operating temperature range of 0 to 70°C and a typical tuneability range of 40nm.

11. A wavelength stabilisation system as in claim 10, where the SSG-DBR laser has a long phase section typically in excess of 0.5 mm to allow control of the phase over the full operating range of temperature

12. A wavelength stabilisation system as in claim 1, where the laser is a vertical cavity filter laser with a typical operating temperature range of 0 to 70°C and a typical tuneability range of 40nm

13. A wavelength stabilisation system as in claim 12, where the vertical cavity filter laser has a long phase section typically in excess of 0.5 mm to allow control of the phase over the full operating range of temperature.

14. A wavelength stabilisation system as in claim 1 where the laser is an external cavity semiconductor laser tuned by the application of bias to one or more external cavity elements.

15. A wavelength stabilisation scheme as in claim 1 where the laser is a vertical cavity surface emitting laser.

16. A frequency referenced coolerless laser diode combining a wavelength stabilisation system according to any of the preceding claims with an optical phase lock loop (OPLL).

17. A frequency referenced coolerless laser diode combining a wavelength stablisation system according to any of the preceding claims with an optical injection phase lock loop system (OIPLL).